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The effectiveness of network connections in operations of a cluster

Abstract: A cluster is a group of companies that co-operate in accordance with a mutual goal and keep the independence in other areas. Clusters are an example of an innovative organisation in a local and regional market. The aim of this article is an attempt of evaluation of a network effectiveness.

Key words: cluster, network, effectiveness

1. Introduction

The concept of network connections of enterprises is not new among a series of many organisational solutions available on the market. To increase the effectiveness of functioning and increase the competitiveness many entrepreneurs decide to enter into various networks. They are based on a dominance of capital ties, organisational ties, social ties and others, but their main aim is to secure for participants a satisfactory level of benefits considered from the market's point of view. The purpose of this article is the attempt to present the evaluation of effectiveness of such a network functioning regardless of whether the results can be seen in quantitative or qualitative terms. The following considerations are based on an analysis of operations of industrial enterprises and service providers operating on the Polish market and functioning within the clusters.

The purpose of this article is to indicate the possibility of assessing the effectiveness of a cluster. The author points out a tool for assessing the effectiveness. For this purpose was used an information base connected with own re-

search that were conduced on the development of clusters in 2008 verified with the present data (Poland, 35 clusters, year 2011).

Information contained in Tables 1 and 2 concerning the directions of cluster's development are the author's version that results from the evaluation of clusters (35) operating in Poland, with special consideration of Beskidzka 5 cluster. Assessment of the effectiveness was made for this particular cluster. A source of information for creation the ranking of success factors (in accordance with the current methodology) were direct opinions of group of experts related with the cluster. The author treats the presented proposition as an example that can be verified with accordance to the current research needs.

2. Network connections of enterprises

Networks operating in the market can take many forms. Also the ways they can be defined are diverse as exemplified by numerous domestic and foreign publications which examine issues of enterprise networks.

A network is defined as co-operation between entities to achieve the benefits, including competitive advantage, and co-operation is in the form of co-operative relations. A network can also be seen as "a set of interconnected relationships of exchanges between […] entities associated with a specific business" (Stryjakiewicz 1999: 34) for "a collection of selected relations (co-operative and competitive) with selected partners that fit into the enterprise's market relations" (Garncarczyk 2004: 15). A network can also be identified as a part of the environment in which the organisation exists creating a structure of relationships that overlap one another (Starnowska 2005: 56) but generally speaking – networks are a collection of various dependencies between different entities that work for mutual interests (Rosińska 2005: 34–45).

In the research literature a lively discussion continues about the definition and characteristics of network connections. J.C. Jarillo (1995: 67) considers as network enterprise such an organisation in which one company takes the role of chief inspector of the organisational and tangible and intangible flows between companies provide efficient meeting the expectations of the final customer.

In another approach we compare a network to an animate nature, and then a network connection is treated as a web functioning with a minimum of hierarchical structures.

A network organisation can also be treated as a system of relationships between companies but these relationships should have horizontal character (Baker 1992: 45–47). It is noted that the proper functioning of a network organisation

depends on a convergence of goals that individual entities want to achieve and an ability to communicate between entities (Castells 2000: 32). A network organisation can therefore be defined by a specification of its features (Nohria and Ghoshal 1997: 16) which can be divided into four groups. The first feature of a network organisation is a transfer of resources between units, which form a network. The second feature is a diversity of relationships between entities from hierarchical (there are then relations with headquarters) to loose market contacts. If headquarters appear its role is limited because of the related entities' independence in a network. The third feature of network connections is limited integration of entities as a result of differences in specific objectives and strategies. However, there are objectives and strategies of the entire system, which improves its competitive position. Another feature is creation and strengthening of information channels in horizontal and vertical systems.

In addition, analysis of literature and analysis of individual network cases conducted by the author indicates that the links in the network structures are long-term, and contacts between partners are repetitive. Extending a time horizon of contacts and their repetition can work out terms of co-operation by reducing transaction costs.

These observations have been made much earlier by experts in the field of management, which is confirmed by the opinion of R. Acelrod from 1984. Companies that maintain more often and longer mutual contacts with each other achieve much greater benefits than those which concluded temporary relationships (Acelrod 1984: 38).

From the foregoing considerations it follows that network connections of enterprises operate by structured interaction based on a co-operation agreement. These connections have different level of hierarchization (or at all) and are based on long-term, repetitive contacts which serve for continuous adaptation to rapid change.

The essence of this approach reflects the OECD definition, which treats a network of enterprises as "a collection of companies that use shared resources to co-operate in joint projects" (OECD 2001: 11). This is confirmed by Cooke (2002: 34) who supplements network characteristics with the following conclusions:

- small networks seek new companies;
- networks with strict conditions for membership are usually characterised by vertical connections, and are comparable in terms of size (as opposed to the typical hierarchical structure of suppliers);
- networks are based on strong interactions arising from trust, reputation and image;
- networks should be bound by legal formalisation but this practically not always happens, although all the networks rely on some type of contract resulting from the jointly undertaken actions;

Causes of network development should be seen:
– in internationalisation processes and globalisation;
– in the growth of a competition's intensity;
– in increasing uncertainty in functioning of enterprises especially from the SME sector;
– in a large complexity of finished products;
– in an advanced specialisation;
– in development of information and communication technology;
– in diversity of consumer's preferences;
– in possibilities of obtaining additional financial resources (especially in former socialist countries where there are large subsidies from EU for companies operating in cluster networks).

Network connections of enterprises may take different forms. Network typology results from an assessment of a dominant company's position, from strength and direction of a relationship between partners and network access. Taking this criteria into account, we can distinguish:
a) dominated networks – connections are based on outsourcing and a dominant company has strategic alliances with co-operators.
b) network of equal partners – partners have similar bargaining power and the network can be changed depending on market's need and development possibilities of the system (Child and Faulkner 1998: 49).
c) informal networks – connections based on informal relationships often within a family.
d) formal networks – based on formal connections with support of professional law and economic advisers and scientists.
e) soft networks – these open networks, allowing direct contact between participants to exchange experiences, have a lot of participants and membership requires a minimum safeguards e.g. charges a membership fee.
f) stable networks – based on agreed by law principles and oriented to specific actions with the use of planning; there is determined allowable amount of members; the network is on the outside represented by an agent and practically these networks take a form of alliances.
g) vertical networks – are broad, they combine companies with similar sizes and complementary profile of action; these formal networks function like hard networks achieving results that are not available to individual companies (Cook 2002: 36).

Network division can also be done because of a nature of the relationship between participants including a network environment and then networks are divided into:
1. Market networks – entities related with the market and producing entities.
2. Regional networks – the division results from a territorial position.
3. Organisational networks – result from ownership and financial connections.

4. Industrial districts – local industrial connections based on co-production.
5. Complementary network connections – co-operation based on vertical co-operative connections.
6. Co-operation and collaboration networks – there are various ranges of connections but mostly they are horizontal ones (Casalet and Gonzalez 2006).

The conclusion derived from the foregoing consideration is that networks are multi-entity structures. Networks may take form of strategic alliances, virtual enterprises, integrated supply chains, acquisitions and clusters. Because the cluster theory is the subject of the following point the author limits herself in this part to a brief discussion about other forms of network.

Strategic alliance is the most common form of co-operation of a contractual nature between existing or potential competitors concluded in order to fulfil a specific strategic objective (e.g. enter into new market, develop new product).

Alliances have basic forms:

– co-operation agreement (licensing, franchising);
– joint venture partnerships – characterised by mutual risk, mutual project, mutual new company;
– purchase of capital share which consist in a partial purchase made in such a way that parties still retain independence (Rokita 2005: 104).

Alliance can be strict (partners produce substitutes, collaboration involves single operations), additive (partners produce similar products, there is a division of tasks but mutual assembly of the final product), complementary (partners produce different products, the aim of the alliance is to extend geographically the market, co-operation includes single actions).

Alliances can form groups called networks of alliances. This happens in situations when some difficulties arise in making mergers and acquisitions. Group forming a network bypasses these limitations and combines strengths of the best companies. The alliance has a global reach, a common niche and appears as a uniform enterprise.

Supply chains are created by entities which are engaged in obtaining, delivering, purchasing and collecting raw materials, material flow within companies, product storage, distribution and transport. An integration of suppliers and customers will occur if we assume a co-operation of all companies participating in the chain of transmission assets from the acquisition of raw materials to a final recipient. This is connected with information and data flow (usage of information centres that provide the VAN-type services – network of additive value) in ensuring the efficiency of the entire process (Barcik 2005: 105). Supply chains are a form of vertical and hard network.

A virtual enterprise is a form of horizontal integration with focusing on leading competencies in order to realise a new offer and get closer to a customer. The virtual enterprise is called a dynamic network in which there is a broker connecting partners, depending on the task.

Networks are also a form of acquisitions involving acquisitions and mergers. The acquisition is to gain control by a company over another company through purchasing its shares in an amount sufficient to administrate it.

The merger is an amalgamation of enterprises as a result of an agreement in order to create a new entity where each company, so far independent, loses its individuality. The merger is voluntary.

Inside enterprises also networks are forming but those networks are based mainly on solutions that are not structured. The teams are formed in order to realise specific tasks called task groups (groups of mutual interests, knowledge teams, hot groups, practitioners community) which are innovative forms of networking within organisations.

Solutions within organisations and external relationships may relate to connections appearing in natural systems. An example of this is the concept of holons network (Maciaszek 2005). Its essence consist in the fact that every element of the whole must work together with another element at different levels and hierarchical systems to achieve the objective which is a life of the whole. The parts, called holons, belong to different levels creating co-operative in horizontal and vertical systems which are called holocracies. The whole must function as a living organism in accordance with the adopted target. This solution is similar to a fractal network where we can observe self-similarity, self-reliance and full dynamics of a part of the whole called fractal. Connections between fractals are based on a mutual provision of services but the central function co-ordinating the whole is not entirely abandoned. This solution is used in tourism, hotel systems or certain types of clusters where entities are centred around the largest of them.

The conducted network characterisation indicates the presence of mutual features. These are:

– reciprocal connections,
– dependence of various entities on resources controlled by other companies,
– connections freedom,
– long-lasting connections,
– poor hierarchisation or lack thereof,
– lack of dominant entity or the dominance weakly accentuated, which usually results from market position or the entity's size but not from entity's network management,
– transfer of resources between units,
– economic and law independence of units,
– lack of territorial restrictions,
– fulfilment of own goals by individual entities of the network,
– improvement of the strengthening of information channels.

Network connections allow participants to achieve tangible benefits. Analysis of the literature allows to define these benefits as:

– reduction of risks arising from the implementation of new products,
– increasing the speed of operation,
– improve the information collecting,
– reduction of opportunistic behaviour,
– increase partners' innovation with its effects on the market.

There are different types of networks on the market and in most cases they have nature of so-called traditional networks which are based on alliances. However, more and more network connections have clusters nature which are increasingly common form of organisational collaboration because of the benefits to participating in it partners – entrepreneurs.

Evaluation of the effectiveness of this co-operation was not a subject to assessments so far mainly because clusters are functioning in Poland for a short period of time.

3. Effectiveness of a cluster's functioning – proposition of the evaluation of the networks' effectiveness

Operational effectiveness of the market must be seen through the prism of the category of effectiveness in question under rules of the economic calculation usage.

Effectiveness should be understood as a relation between a result of an effort while the result should exceed the effort. In situation when those characteristics are different from such relations we cannot speak of effectiveness. Besides, effectiveness is closely related to the efficiency which must be understood as the objective function. Intentional action from the praxeology point of view consist in achieving a target fully or partially but may be also associated with an inability to achieve an objective (action ineffective) or with realising an objective but related to aspirations of another entity (action counterproductive). It is important that determining a level of successfulness precedes the determination of effectiveness. It is known that successful action may or may not be effective but effective action will always be effective. It is important to consider the issue through the prism of economic calculation which suggests that we cannot simultaneously maximise results and minimise efforts. The principle of economic calculation assumes that seeking to maximise results an amount of efforts should be set at a certain level or vice versa – seeking to minimise efforts level of results should be established. Such approach guarantee the proper functioning of the market systems.

The author of this article proposes a simple formula that uses a compilation of scaling methods related to features constituting results and efforts. This al-

lows to separate quantitative and qualitative features so the measurement of effectiveness may be applied to tangible elements that characterise a cluster and factors that cannot be presented quantitatively but have purely qualitative nature.

1. The first step is choosing features that constitute the purpose of action evaluation.
2. The second step is choosing a grading scale, e.g. 5pts – very high, 4pts – high, 3pts – medium, 2pts – low, 1pts – very low, assuming that there is always a level of an effort but the result may not appear so the effort (E) cannot be valued at "0" but it may hover close to this value and even reach it. This assumption stems from the fact that taking any action always bears some level of effort but the result is not always achieved. This approach has its reference in communication theory where it is said that a sender of a message always receives a recipient's respond even if he/she does not answer because in theory a lack of reaction is also a kind of reaction.
3. The third step is calculating a punctual relation between result/effort if we know that the effectiveness will appear when result/effort > 1 therefore the used scale will provide a numerical value equal to the number contained in the interval <0,5> (for the proposed example) or another if different numerical values respond to the point scale.

We can assume that the result (R) is an element of the interval <0,E> where E determines the upper limit of the point evaluation for the result and the effort is a part of interval <0,E> where E is the upper limit of the point evaluation for the effort.

The calculations enable comparison between elements making up the efficiency of a network which can also be applied to other operations that efficiency should be discovered but its calculation by using specific numerical values is impossible.

The main disadvantage of this method is a subjectivity of the evaluation and selection of features to evaluation and also too general determination of effectiveness. The advantage lies in possibility of indicating the level of efficiency for operations that qualify to eligible evaluations and possibility of comparison between entities operating in the market from the standpoint of the relation between result and effort that proves the existence or its lack of an efficient enterprise.

The following table presents a set of factors (ranking) considered as success factors of the examined cluster (using strategic analysis determining the sector's success factors – verification for the cluster's needs).

By supplementing the ranking with evaluation of the effectiveness of certain factors we obtained information that cluster as a whole is achieving the effectiveness (average efficiency $E > 1$) but individual factors determining its success demonstrate a varied horizontally effectiveness, as shown in Table 1.

Table 1. Ranking of success and effectiveness factors of a cluster (X)

No.		Key factors of a cluster's success	Effectiveness (r/e) pts	Weighted value (pts)
1		2	3	4
1	1.1	Relationship between cluster's participants and region	5/3	15
	1.2	Participation of local government units in a cluster	5/1	15
	1.3	Localisation of a cluster in a region with high traditions	5/1	15
2	2.1	Cluster's role for an industry in a voivodeship	4/1	12
	2.2	Local brand	3/4	12
	2.3	Acquiring EU funds for clustering	5/3	12
	2.4	Stimulation of a cluster by a variety of outdoor project	5/2	12
	2.5	Investment attractiveness of an industry	3/5	12
3	3.1	Market size of an industry and an expected growth	5/4	10
4	4.1	Level of interpersonal relations in a region (communes in a cluster)	3/2	9
	4.2	Intensity of competition in cluster's market	3/5	9
	4.3	Level of market awareness of enterprises in a cluster	2/5	9
5	5.1	Regional density of enterprises in an industry	4/5	8
	5.2	Representation of a cluster's founders in the economic environment	4/4	8
	5.3	Program of industry's development in cluster's area	4/5	8
	5.4	Formalise of a membership procedures in a cluster	2/5	8
	5.5	Influence of government increasing the sense of stability among cluster's participants	5/2	8
	5.6	Increasing demand for various types of products from an industry	4/1	8
	5.7	Using modern technology to transfer information	3/5	8
	5.8	Growing role of social, political and other factors in a cluster	3/4	8
	5.9	Level of influence of various projects on a cluster	3/5	8

Table 1 continued

1		2	3	4
6	6.1	Supply for offers mainly from potentially competing companies	5/1	6
	6.2	Possibility of obtaining diversified products	4/5	6
	6.3	Capital requirement	3/5	6
	6.4	Critical mass of a cluster	2/5	6
7	7.1	Seasonality or continuity of an offer	4/5	4
	7.2	Innovation potential in an industry	3/5	4
	7.3	Level of links with science	2/4	4
	7.4	Dissemination of knowledge about clusters	3/5	4
	7.5	Mechanisms of exchange information between a cluster and a region	2/5	4
8	8.1	Compatibility of development directions of national industry products with guidelines of industry's development program in a cluster	3/5	3
	8.2	Supporting of the national initiating	1/5	3
	8.3	Promoting lifestyle causing the demand for new products from an industry	4/5	3
	8.4	Interest in working in an industry	4/5	3
	8.5	Level of labor supply in an industry	3/5	3
	8.6	Leader presence in a cluster	3/5	3
	8.7	Phase of cluster development	2/5	3
	8.8	Level of foreign offers' competitiveness	5/1	3
9	9.1	Availability of Polish labour market in an industry for foreign staff	1/3	2
	9.2	Level of internationalisation of an industry in terms of ownership and organisational	3/5	2
	9.3	Source of cluster's initiatives	4/5	2
	9.4	Level of regional products' uniqueness	4/5	2
	9.5	Influence of government on an industry	4/3	2
10	10.1	Enterprises' tax rate	4/4	1

Source: own analysis.

Presented ranking shows that the most important internal factors stimulating a cluster to success are:
– connections between cluster's participants and a region,
– activity of regional government in a cluster,
– presence in a region of major traditions associated with an industry,
– having a local brand of products,
– investment attractiveness of an industry,

Among external factors we must enumerate:
– obtaining funds from the EU,
– stimulating a cluster by various projects.

So, to become successful a cluster needs the flow of funds, investment, government support and usage of regional industry tradition and sales of branded products. The least important to a cluster's success is high taxation of enterprises and fact that cluster initiative and its support have a top-down nature. In such situation we can see that enterprises co-operating with each other will develop in direction marked out by a cluster as a whole. A success of a cluster is the success of entrepreneurs participating in it. A cluster does not allow companies to individually shut in development. Success is the result of a synergy of co-operation in a network.

Linking the ranking of a cluster's success factors with evaluation of those factors' effectiveness we can see that among many evaluated factors, only two affect the efficiency of a cluster in an indisputable manner. These are the participation of local government units in a cluster and the location in a region with high traditions. These factors also have the highest rank in the ranking of success factors. It seems that these two factors are the most important assets of a network which in case of any threat to network's existence can become a support. Whether they be sufficient will prove when a comparison with other similarly evaluated networks will be made.

By making comparisons of several networks using analogous sets of evaluations of their success and effectiveness for this success, we can identify those clusters that augur the best for the future. We can also specify such features that enable a development of a cluster in an efficient way, directed at very precise operations.

In the examined case at the highest efficiency of a network affects an effort to keep influence in local government and that the network operates in an area with traditions mutual to this network's specification. It is also important to use operations of competitors and their offer either domestic and foreign (compare Table 2).

Table 2. Factors of success and effectiveness of a cluster (X)

Key factors of a cluster's success	Effectiveness (r/e) pts	Weighted value (pts)
Relationship between cluster's participants and region	5/3	15
Participation of local government units in a cluster	5/1	15
Localisation of a cluster in a region with high traditions	5/1	15
Cluster's role for an industry in a voivodeship	4/1	12
Acquiring EU funds for clustering	5/3	12
Stimulation of a cluster by a variety of outdoor project	5/2	12
Market size of an industry and an expected growth	5/4	10
Representation of a cluster's founders in the economic environment	4/4	8
Influence of government increasing the sense of stability among cluster's participants	5/2	8
Increasing demand for various types of products from an industry	4/1	8
Supply for offers mainly from potentially competing companies	5/1	36
Level of foreign offers' competitiveness	5/1	
Enterprises' tax rate	4/4	1

Source: own analysis.

4. Conclusions

The above discussion does not included the issues of effectiveness but the author sees the possibility of treating the major factor of success in such way that the target becomes a function of the success factors.

Understanding the effectiveness of a cluster in that way will allow to determine levels of its realisation which in combination with the indicated method for assessing the effectiveness will enable a comprehensive approach to the issue of networking effectiveness regardless of the time of network's functioning. Then we can make the evaluation also in the system of *ex ante* but not in e*x post* which in Polish conditions is still not possible due to the short time of clusters functioning.

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